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WELLS ST. JOHN P.S.
601 W. FIRST AVENUE, SUITE 1300
SPOKANE, WA 99201

EXAMINER

CHAUDHRY, SAEED T

ART UNIT	PAPER NUMBER
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1746

DATE MAILED: 09/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/636,028

Applicant(s)

BASCERI ET AL.

Examiner

Saeed T. Chaudhry

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) 24-36 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 8/6/03.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: ____.

DETAILED ACTION

Election/Restriction

Restriction to one of the following inventions is required under 35 U.S.C. 121:

Group I, Claims 1-23, drawn to a process of cleaning a processing chamber, classified in Class 134, subclass 22.1.

Group II, Claims 24-36, drawn to a processing system having a reactor; a supercritical source and a recovery vessel, classified in Class 210, subclass 767.

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (M.P.E.P. § 806.05(e)). In this case the process as claimed can be practiced by another materially different apparatus such as without a recovery vessel or the apparatus as claimed can be used to practice another and materially different process such as depositing a coating on a substrate.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, have acquired a separate status in the art because of their recognized divergent subject matter, the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

During a telephone conversation with Ms. Jennifer J. Taylor on 2005 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-23. Affirmation of this election must be made by applicant in responding to this Office action. Claims 24-36 are withdrawn from further consideration by the Examiner, 37 C.F.R. § 1.142(b), as being drawn to a non-elected invention.

Joint Inventors

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 C.F.R. § 1.48(b) if one or more of the

Art Unit: 1746

currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a diligently-filed petition under 37 C.F.R. § 1.48(b) and by the fee required under 37 C.F.R. § 1.17(h).

Claim Rejections - 35 USC § 112

Claim 6 and 9 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 6 is indefinite and confusing in the recitation "at least one surface" because it is not clear that if this is referred to "at least one internal surface" or another surface.

Claim 9 recites the limitation "the deposition chamber" in 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

- (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
- (c) he has abandoned the invention.
- (d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months before the filing of the application in the United States.
- (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.
- (f) he did not himself invent the subject matter sought to be patented.
- (g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

Claims 1, 2-4, 6, 8, 10-12, 15-16, 19-20, and 22, 23 are rejected under 35 U.S.C.

§ 102(b) as being anticipated by Jackson et al.

Jackson et al (5,013,366) disclose a process for removing contaminants such as oils, grease, flux residues and particulates from complex hardware by supercritical fluids such as hydrocarbons i.e. methane, ethane, propane and inorganics such as carbon dioxide, ammonia, helium krypton, argon, and nitrous oxide and mixture thereof (see col. 3, lines 35-47).

For continuous cleaning processes, the dense fluid is introduced into chamber 12 by pump 24 at the same rate that contaminated gas is removed through line 26 in order to maintain the pressure in chamber 12 at or above the critical pressure. This type of process provides continual removal of contaminated gas while the phase of the dense fluid within chamber 12 is being shifted back and forth between liquid and supercritical states through temperature cycling (see col. 8, lines 33-37).

Carbon dioxide is a preferred dense phase gas for use in practicing the present invention since it is inexpensive and non toxic. The critical temperature of carbon dioxide is 305.degree. Kelvin (32.degree. C.; and the critical pressure is 72.9 atmospheres (see col. 3, line 67 through col. 4, line 60).

Contaminant materials which may be removed from substrates in accordance with the present invention include, but are not limited to, oil, grease, lubricants, solder flux residues, photoresist, particulates comprising inorganic or organic materials, adhesive residues, plasticizers, unreacted monomers, dyes, or dielectric fluids (see col. 7, lines 12-18).

An exemplary cleaning process involves initially placing the hardware into the cleaning vessel, chamber 12. The chamber 12 is closed and purged with clean, dry inert gas or the

cleaning gas from reservoir 22. The temperature of the chamber 12 is then adjusted utilizing the internal heating element 14 and coolant from reservoir 18 to which is provided externally through a jacketing system, in order to provide a temperature either above or below the critical temperature for the cleaning gas or gas mixtures. The chamber 12 is then pressurized utilizing pump 24 to a pressure equal to or above the critical pressure for the particular dense phase gas cleaning fluid (see col. 8, line 60 through col. 9, line5).

The modifier is chosen to enhance or change certain chemical properties of the dense phase gas. For example, the addition of anhydrous ammonia to xenon provides a mixture that exhibits hydrogen bonding chemistry, which xenon alone does not. Similarly, the modifier may be used to provide oxidizing capability or reducing capability in the dense phase gas, using liquid modifiers such as ethyl alcohol, water, acid, base, or peroxide (see col. 10, lines 1-18).

Jackson et al do not specifically disclose to clean the chamber walls, since Jackson et al clean the substrate inside the chamber with supercritical fluid and do a phase change between the gas and the supercritical state. The process inherently clean the surfaces other than the substrate, which are walls surfaces, substrate holder, pipes and other hard ware of the cleaning system.

Claims 1, 3, 6, 7, 9, 10, 11, 13-16, 19-20, and 22-23 are rejected under 35 U.S.C. § 102(b) as being anticipated by Cotte et al.

Cotte et al (6,454,869) disclose a method of removing organic material from a surface of semiconductor manufacturing equipment. A semiconductor processing, handling and manufacturing equipment 16 to be cleaned is introduced into a cleaning zone 14 of a processing chamber 12 wherein the equipment 16 is exposed to liquid carbon dioxide or supercritical carbon dioxide. To ensure that the liquid carbon dioxide and supercritical carbon dioxide remains in the

Art Unit: 1746

liquid or supercritical state during processing, the processing chamber 12 is maintained at a pressure in the range of between about 1,000 psi and about 6,000 psi. The temperature within processing chamber 12 is maintained in a range of between about 40.degree. C. and about 100.degree. C. (see col. 2, lines 37-57).

Liquid or supercritical carbon dioxide is provided into processing chamber 12 by means of a liquid or supercritical carbon dioxide source 30 (see col. 2, lines 66-67). The semiconductor processing, handling and manufacturing equipment 16 to be cleaned in accordance with the present invention, as stated above, is introduced into sample zone 14 of the chamber 12 wherein it is exposed to liquid or supercritical carbon dioxide (see col. 3, lines 19-23).

As those skilled in the art are aware, coating of semiconductor wafers with photoresists is a critical processing step in the formation of semiconductor chips. Typically, a photoresist is cast upon semiconductor wafers while the wafers are rotated to provide a uniform coating thereupon. Such turntable assemblies are schematically represented at 44 in FIG. 4. Obviously, these assemblies are contacted with photoresist residue which falls off wafers during application. As such, they are ideal candidates for cleaning in accordance with the process of the present invention (see col. 3, lines 44-56).

A photoresist may be better processed when the liquid or supercritical carbon dioxide contacts the photoresist in the presence of a surfactant. Thus, in a preferred embodiment of the present invention, the cleaning agent is a liquid or supercritical carbon dioxide composition which includes a surfactant (see col. 3, lines 60-65).

Art Unit: 1746

The composition employed in the process of the invention can, in addition to supercritical or liquid carbon dioxide and a surfactant, include a further component, a co-solvent (see col. 4, lines 58-60).

Cotte et al do not specifically disclose to clean the chamber walls, since Cotte et al clean the substrate inside the chamber with supercritical fluid, co-solvent and a surfactant. Therefore, the process inherently clean the surfaces other than the substrate, which are walls surfaces, substrate holder, pipes and other hard ware of the cleaning system.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made

The factual inquiries set forth in *Graham v. John Deere Co.*, 148 USPQ 459, that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or unobviousness.

Claims 2, 9, 18 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson et al or Cotte et al.

Jackson et al and Cotte et al were discussed supra. However, the reference fails to disclose specific residue as disclosed in claim 2 and residue from the surface of the trap or dispenser.

Jackson et al and Cotte et al disclose to remove organic or inorganic residue from the surfaces with supercritical fluid such as carbon dioxide. Therefore, one of ordinary skill in the art would expect that these processes would remove the residues with supercritical fluid as claimed therein.

Further, Jackson et al and Cotte et al disclose to remove residue inside of a chamber. Therefore, one of ordinary skill in the art would expect that parts such as trap or dispenser would be cleaned with the supercritical fluid since the fluid is exposed to the all the components in chamber.

Claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Jackson et al or Cotte et al in view of Goffnett et al.

Jackson et al and Cotte et al were discussed supra. However, the reference fails to disclose that the processing chamber is selected from the group of a CVD chamber.

Goffnett et al (5,108,512) disclose a method for removing inner surface of a CVD chamber with pellets of carbon dioxide (see claims).

It would have been obvious at the time applicant invented the claimed process to clean a CVD chamber with the processes of Jackson et al or Cotte et al because it is known in the art to clean a CVD chamber as disclosed by Goffnett et al and one would expect that supercritical fluid would remove the residue in the CVD chamber because Jackson et al and Cotte et al disclose to remove organic and inorganic residues.

Claims 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson et al or Cotte et al in view of Smith, Jr. et al.

Jackson et al and Cotte et al were discussed supra. However, the reference fails to treat the surface with solvent before the treatment with supercritical fluid.

Smith, Jr. et al (5,417,768) disclose to remove residue from a surface by treating with a primary solvent and then flushing the solvent from the vessel and supplying carbon dioxide at supercritical conditions (see col. 5, lines 49-51 and claims).

Art Unit: 1746

It would have been obvious at the time applicant invented the claimed process to pre-treat the surface with a solvent as disclosed by Smith, Jr. et al into the processes of Jackson et al or Cotte et al to enhance the cleaning effect.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Saeed T. Chaudhry whose telephone number is (571) 272-1298. The examiner can normally be reached on Monday-Friday from 9:30 A.M. to 4:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Michael Barr, can be reached on (571)-272-1414. The fax phone number for non-final is (703)-872-9306.

When filing a FAX in Gp 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communication with the PTO that are for entry into the file of the application. This will expedite processing of your papers.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (571) 272-1700.

Saeed T. Chaudhry
Patent Examiner


MICHAEL BARR
SUPERVISORY PATENT EXAMINER